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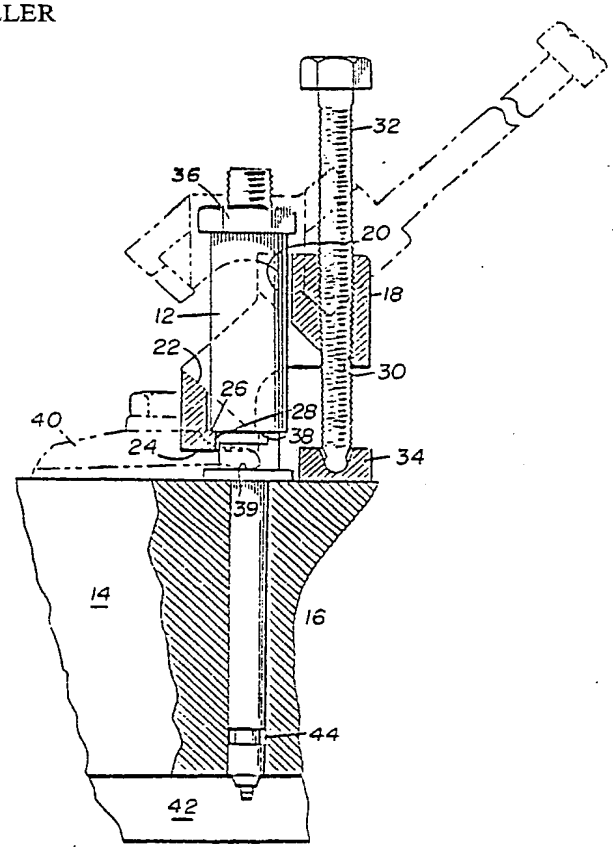
(54) Title: FUEL INJECTION VALVE PULLER

(57) Abstract

A fuel injection valve removal tool (10) has a pair of angularly intersecting valve receiving bores (20, 22) and an offset threaded member (32). The tool (10) passes over an injection valve (12) so that a ledge (26) in one of the bores (20) may engage the injection valve (12) while the threaded member (32) engages the engine. Rotation of the threaded member (32) results in removal of the injection valve (12) from the engine (12).



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Description

Fuel Injection Valve Puller

Technical Field

This invention relates generally to tools and more particularly to a puller tool for removing injection valves from an engine.

Background Art

In certain applications, particularly in engines, certain elements may be placed adjacent a cylinder or the like wherein, after a period of use, the element becomes cemented into the cylinder or the like. In particular, certain types of injection valves used in compression ignition engines are slidably positioned in the cylinder head of those engines and retained there by a clamp or the like. The clamp generally engages a shoulder about the injection valve, and by means of a bolt passing through the clamp and into the cylinder head, the clamp acts as a hold-down for the injection valve. During operation of the engine, small amounts of burned fuel residue such as carbon particles are deposited in the cylinder so that after a prolonged period of use the injection valve becomes "cemented" in the head. Thus, removal of the valve becomes difficult, if not impossible without the use of some sort of a removal tool.

In the past, it has been the practice to use an impact tool to impart a shock or the like to the injector nozzle, thereby breaking the carbon seal resulting from deposits during operation of the engine. Use of an impact tool requires sufficient

space adjacent the engine to operate the impacting portion of the tool. Furthermore, a slide hammer-type impact tool or a simple impact tool can, in certain cases, cause damage to an injector valve that ordinarily could be cleaned and reused.

The present invention is directed to overcoming one or more of the problems as set forth above.

Disclosure of Invention

In one aspect of the invention, an injection valve removal tool is formed of a gripping member defining a first bore, a second bore intersecting the first bore, and a threaded bore having an axis generally parallel to the axis of the first bore. The gripping member further defines a shoulder adjacent one end of the first bore capable of engagement with an injection valve. Also included with the tool is a threaded member threadably engaged in the threaded bore.

In injection valve removal situations wherein the valve member is slidably positioned in the engine cylinder head, carbon deposits quite frequently "cement" or "freeze" the injection valve into the cylinder head. Removal of the injection valve in the past has generally been accomplished by an impact tool to break the valve away from the carbon deposits. However, such tools have the obvious disadvantage of damaging injection valves that conceivably need only minor repairs. Accordingly, to be able to remove an injection valve without impact to the valve is desirable. This invention accomplishes this through the use of a puller tool actuated by a threadable member engaging the engine head.

Brief Description of the Drawing

Figure 1 is a perspective view of a fuel-injection valve puller tool which forms an embodiment of the present invention.

Figure 2 is an elevational view, partly in section, of the fuel-injection valve puller tool illustrated in Figure 1 shown in conjunction with an injection valve and an engine.

Best Mode for Carrying Out the Invention

Referring to Figure 1, a puller tool 10 is shown in perspective. This puller tool 10 is particularly appropriate for removing a fuel injection valve 12 (see Figure 2) which has become "cemented" into an engine cylinder head 14 by carbon deposits accumulated about the shank 16 of fuel injection valve 12.

A puller tool 10 is comprised of a gripping member 18 which has formed therethrough a pair of angular valve receiving bores including a first bore 20 and a second bore 22. Second bore 22 angularly intersects first bore 20 as indicated in Figures 1 and 2 of the drawings. The angle of intersection is generally about 45° although a greater or lesser angle is possible. Formed in first bore 20 and adjacent one end 24 is a lip or ledge 26 formed by a counterbore 28 axially aligned with first bore 20.

A threaded bore 30 is formed in gripping member 18 laterally displaced from and having an axis generally parallel to first bore 20. Threaded bore 30 has received therein a threaded member such as bolt 32 which may engage a pivotally attached wear plate or shoe 34 to be positioned on cylinder head 14.

It is important to note that second bore 22 is of sufficient size to be positioned over the largest diameter of fuel injection valve 12 which in the instance illustrated in Figure 2 includes a hexagonal member such as nut 36. At the same time, in the particular embodiment illustrated in Figure 2, first bore 20 must be of sufficient diameter to receive therethrough the outwardly extending portion of fuel injection valve 12, while the ledge 26 should be of sufficient size to engage the shoulder 38 normally found on injection valves of this type. Similar shoulders or reliefs 39 are used for the purpose of clamping the injection valve to cylinder head 14.

Industrial Applicability

This puller tool is particularly adaptable for removing injection valves such as injection valve 12 from a cylinder head 14. Normally, injection valves such as injection valve 12 are of the type slidably positioned in cylinder head 14 and held therein by a clamp 40. Fuel is passed through the injection valve in a manner well known in the art, which will not be further discussed here. Ignition of the fuel in the cylinder 42 normally results in some formation of carbon. Consequently, a carbon dam 44 may be found on the shank 16 of the fuel injection valve 12. During use, the carbon dam 44 may become worn and carbon is then free to pass by the dam 44. When this occurs, it becomes difficult to remove the fuel injection valve 12 from the cylinder head 14 without some assistance.

Accordingly, puller tool 10 may be positioned about fuel injection valve 12 as shown in phantom in Figure 2. This orientation is preferably about 45 degrees from the ultimate usable orientation of the tool when it is positioned for removal of the valve. The tool is then passed downwardly about the upper or outwardly extending portion of fuel injection valve 12 so that the ledge 26 may engage shoulder 38. This, of course, requires rotation of the tool which also positions the threaded member or bolt 32 generally parallel to the fuel injection valve 12. The bolt 32 may then engage cylinder head 14 or shoe 34 may be placed between head 14 and bolt 32. By rotation of bolt 32, ledge 26 comes up firm against the injection valve while continued rotation of the bolt 32 results in withdrawal of the injection valve from the cylinder head with a minimum of effort thereby eliminating or minimizing damage to the injection valve. Of course, it should be understood that clamp 40 must first be removed before an attempt is made to remove the fuel injection valve.

Other aspects, objects, and advantages of this invention can be obtained from a study of the drawings, the disclosure and the appended claims.

Claims

1. An injection valve removal tool comprising:

a gripping member (18) having a first bore (20), a second bore (22), said second bore (22) angularly intersecting said first bore (20); and a threaded bore (30) having an axis generally parallel to the axis of said first bore (20), said gripping member (18) further having a ledge (26) in said first bore (20) adapted for engagement with an injection valve (12); and

a threaded member (32) threadably engaged in said threaded bore.

2. The injection valve removal tool of claim 1 wherein said first (20) and said second (22) bores intersect generally at a 45° angle.

3. The injection valve removal tool of claim 1 wherein said second bore (22) has a diameter generally greater than the largest diameter of the injection valve (12).

4. The injection valve removal tool of claim 1 in combination with an engine (14) and an injection valve (12), wherein said threaded member (32) is engagable with said engine (14) and said ledge (26) engagable with said injection valve (12).

5. An injection valve removal tool in combination with an injection valve (12) for use in an engine (14), the injection valve removal tool comprising:

a gripping member (18) defining a first bore (20) and a second bore (22), said second bore (22) angularly intersecting said first bore (20), and a threaded bore (30) having an axis generally parallel to the axis of said first bore (20), said gripping member (18) further defining a ledge (26) in said first bore (20) adapted for engagement with said injection valve (12); and

a threaded member (32) threadably disposed in said threaded bore (30) and engagable with said engine (14).

FIGURE 2

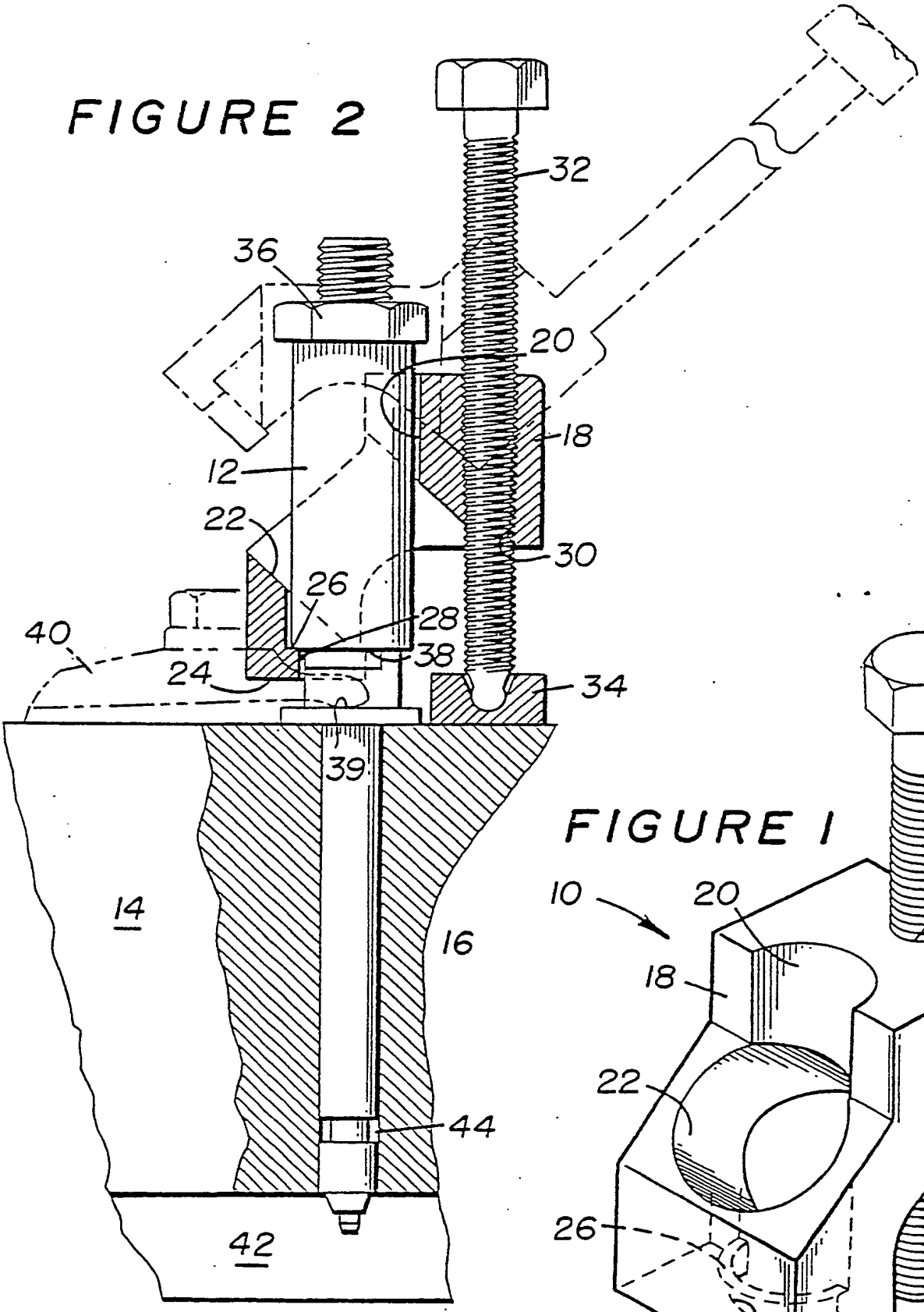

FIGURE 1

INTERNATIONAL SEARCH REPORT

International Application No PCT/US80/00224

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[3] B23P 19/04
U.S. Cl. 29/263

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	29/213R,213E,214,256,258,259,263

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US, A, 1,659,523, PUBLISHED 14 February 1928, FARRELL et al.	1-5
A	US, A, 3,568,294, PUBLISHED 09 March 1971, CONNER	1-5
A	US, A, 3,107,420, PUBLISHED 22 October 1963, GOBBY	1-5

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
10 November 1980	11 DEC 1980
International Searching Authority [1]	Signature of Authorized Officer [20]
ISA/US	Robert Watson